We claim:

1. A brazed plate heat exchanger for transferring heat between a first fluid and a second fluid, the first fluid being pressurized to greater than 1000 psi, the brazed plate heat exchanger comprising:

a plurality of plate pairs, each plate pair enclosing a plurality of flow channels extending from a first inlet opening to a first outlet opening, each of the flow channels having a hydraulic diameter less than 1 mm, the plate pairs arranged as a stack with the first inlet openings being aligned with each other to define a first inlet manifold for distributing the first fluid to the flow channels, and the second openings aligned with each other to define a first outlet manifold for collecting the first fluid from the flow channels;

a plurality of turbulator plates interleaved between the plate pairs to define flow paths for the second fluid, each of the turbulator plates sandwiched between the plate pairs to provide structural support thereto; and

reinforcements extending between each of the plate pairs, aligned with the first inlet and outlet openings, and defining the first inlet and outlet manifolds between the plate pairs.

2. The brazed plate heat exchanger of claim 1 wherein the reinforcements comprise a plurality of washers interleaved between the plate pairs.

3. The brazed plate heat exchanger of claim 3 wherein the first inlet and outlet openings are circular openings and each of the washers includes an annular step that is received in a corresponding one of the first inlet and outlet openings.

4. The brazed plate heat exchanger of claim 1 further comprising pairs of channeled plates sandwiched between the plates of each of the plate pairs, grooves extending through each of the channeled plates to define the flow channels with the grooves of the other channeled plate of the pair.

5. The brazed plate heat exchanger of claim 1 wherein the plates of each of the plate pairs are drawn-cup plates, and one of the plates of each of the plate pairs is dimpled to define the flow channels.

6. The brazed plate heat exchanger of claim 1 wherein:

the first inlet and outlet openings are circular openings; and

the reinforcements comprise a cylindrical inlet header tube extending through the first inlet openings with an outer surface of the inlet header tube brazed to a surrounding periphery of the inlet openings in each of the plates of each of the plate pairs, and a cylindrical outlet header tube extending through the first outlet openings with an outer surface the outlet header tube brazed to a surrounding periphery of the outlet openings in each of the plates of each of the plate pairs.

7. The brazed plate heat exchanger of claim 6 wherein each of the header tubes includes a plurality of slots, each of the slots aligned with the flow channels of a corresponding plate pair.

8. The brazed plate heat exchanger of claim 1 wherein each of the plate pairs further includes a pair of sealed openings extending through the plate pair, one of the pair of sealed openings in each of the plate pairs being aligned with the one of the pair of sealed openings in the adjacent plate pairs to define a second inlet manifold to distribute the second fluid to the flow paths for the second fluid, the other of the pair of sealed openings in each of the plate pairs being aligned with the other of the pair of sealed openings in the adjacent plate pairs to define a second outlet manifold to collect the second fluid from the flow paths for the second fluid.

9. The brazed plate heat exchanger of claim 1 further comprising:

a top plate defining an upper exterior of the heat exchanger;

a turbulator plate sandwiched between the top plate and an upper-most one of the plate pairs to define flow paths for the second fluid and provide structural support to the plate pairs;

a bottom plate defining a lower exterior of the heat exchanger; and

a turbulator plate sandwiched between the bottom plate and a lower-most one of the plate pairs to define flow paths for the second fluid and provide structural support to the plate pairs.

10. The brazed plate heat exchanger of claim 1 wherein each of the turbulator plates is a lanced and offset fin.

11. A brazed plate heat exchanger for transferring heat between a first fluid and a second fluid, the first fluid being pressurized to greater than 1000 psi, the brazed plate heat exchanger comprising:

a plurality of flat plate subassemblies, each of the subassemblies comprising a pair of outer flat plates and a pair of channeled plates sandwiched between the outer plates, each of the plates having an inlet opening and an outlet opening spaced from the inlet opening, the inlet openings aligned with each other to define a first inlet manifold, the outlet openings aligned with each other to define a first outlet manifold, each of the channeled plates including a plurality of grooves that cooperate with the grooves of the other channeled plate of the pair to define a plurality of flow channels for the first fluid extending between the inlet openings to the outlet openings of the pair;

a plurality of turbulator plates interleaved between the subassemblies to define flow paths for the second fluid, the turbulator plates sandwiched between the subassemblies to provide structural support thereto; and

a plurality of washers aligned with the inlet and outlet openings and interleaved between the subassemblies to provide structural support thereto, with the washers that are aligned with the inlet openings defining the first inlet manifold between the subassemblies, and the washers that are aligned with the outlet openings defining the first outlet manifold between the subassemblies.

12. The brazed plate heat exchanger of claim 11 wherein the inlet and outlet openings in the outer plates are circular openings and each of the washers includes an annular step that is received in a corresponding one of the inlet and outlet openings in the outer plates without extending through the outer plate.

13. The brazed plate heat exchanger of claim 11 wherein the grooves in one of the channeled plates of each pair extend longitudinally between the inlet and outlet openings, and the grooves in the other channeled plate of the pair extend transverse to the grooves in the one of the channeled plates.

14. The brazed plate heat exchanger of claim 11 wherein each of the subassemblies further includes a pair of sealed openings extending through the subassembly, one of the pair of sealed openings in each of the subassemblies being aligned with the one of the pair of sealed openings in the adjacent subassemblies to define an second inlet manifold to distribute the second fluid to the flow paths for the second fluid, the other of the pair of sealed openings in each of the subassemblies being aligned with the other of the pair of sealed openings in the adjacent subassemblies to define a second outlet manifold to collect the second fluid from the flow paths for the second fluid.

15. The brazed plate heat exchanger of claim 14 further comprising a plurality of spacer plates interleaved between the subassemblies, each of the spacer plates sandwiched between an adjacent pair of the subassemblies and surrounding the turbulator plate and the washers sandwiched between the adjacent pair to enclose a flow space for the second fluid.

16. The brazed plate heat exchanger of claim 11 further comprising:

a top plate defining an upper exterior of the heat exchanger;

a turbulator plate sandwiched between the top plate and an upper-most one of the plate subassemblies to define flow paths for the second fluid and provide structural support to the subassemblies;

a bottom plate defining a lower exterior of the heat exchanger; and

a turbulator plate sandwiched between the bottom plate and a lower-most one of the subassemblies to define flow paths for the second fluid and provide structural support to the subassemblies.

17. The brazed plate heat exchanger of claim 11 wherein each of the turbulator plates is a lanced and offset fin.

18. A transcritical cooling system comprising:

a working fluid flow loop;

a compressor connected to the working fluid flow loop to receive the working fluid therefrom and to compress the working fluid to a supercritical pressure for delivery to the working fluid flow loop; and

a brazed plate heat exchanger connected to the working fluid flow loop to receive the working fluid therefrom and return the working fluid thereto, the brazed plate heat exchanger including a plurality brazed, stacked plate subassemblies that define high pressure flow paths for the working fluid, the brazed plate subassemblies interleaved with another set of flow paths for another fluid to transfer heat between the working fluid and the other fluid.

19. The transcritical cooling system of claim 18 wherein each of the subassemblies comprise a pair of mating drawn-cup plates.

20. The transcritical cooling system of claim 18 wherein each of the subassemblies comprises a pair of outer flat plates and a pair of channeled plates sandwiched between the outer flat plates.